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ABSTRACT

These three units of the Learning Activity Packages (LAPs) for individualized instruction in physical science cover the physical and chemical properties of water, dehydration of crystals, solutions, acidity, strong and weak bases, neutral properties of salts, amorphous forms of carbon, hydrocarbons, and petroleum products. Each unit contains a rationale for the material; a list of behavioral objectives for the unit; a list of resources including texts, reading assignments, specified problems, handouts, tape recordings, and science activities and experiments; a problem set for student self-evaluation; suggestions for advanced study; and references. Related physical science LAPs are SE 016 422 and SE 016 424. (CC)

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U.S. DEPARTMENT OF HEALTH
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

LEARNING
ACTIVITY
PACKAGE

THE CHEMISTRY OF WATER

Ninety Six High School - Ninety Six, S.C. -

PHYSICAL SCIENCE 93-94

REVIEWED BY JAR

LAP NUMBER 5

WRITTEN BY G. J. Williams

SE 016 423

Rationale

In your last LAP we studied about matter and energy. Our study of matter stressed that there are three basic states of matter, solids, liquids and gases. Water was one of the substances that could exist in all three states. In this LAP we are going to learn more about this interesting substance water.

Everyone knows a good deal about water, what it feels and looks like, how plentiful it is, and why it is important. But few people think of water as a chemical- sometimes reacting with other substances and producing new materials.

Many of the important changes in the world are brought about by water. It is especially important to us because it dissolves so many things; removes minerals from rocks and soil, carries chemicals into roots of plants and transports food and waste through the bodies of living things.

In this LAP we will learn about the significance of water, what it is made up of, some uses for water and how it can be purified.

Our next LAP will deal with water in solution in the form of acids, bases and salts.

Section I

Behavioral Objectives

Using the prescribed references listed you will on the progress and /or LAP Test be able to:

1. Make distinctions between the following:
   a. Physical properties of water and chemical properties of water.
   b. Hydrated crystals and Dehydrated crystals
2. Classify given properties as either physical or chemical properties of water
3. Identify the boiling and freezing points of water on given thermometers.
4. State how given solutes affects the boiling and freezing points of water.
5. Demonstrate how reduced pressure on boiling water affects the boiling point.
6. List the names of two chemicals that contains water of crystallization.
7. Demonstrate how to hydrate and dehydrate crystals containing water of crystallization.

Resources

____ 1. Modern Physical Science pages 71-82

____ 2. Exploring Physical Science pages 18-36

____ 3. Pathways In Science pages 39-40 and page 60

____ 4. Cambridge Work- A- Text Physical Science pages 181-184

____5. The Physical World pages 255-256

Handouts:

____ 1. Worksheet- Research on Water

Tapes and Audio Visuals:

Filmstrip: Water and Its Uses

Experiments:

1. How reduced pressure affects the boiling point of boiling water
2. Dehydrating and hydrating crystals that contains water of hydration

Self Evaluation

1-1. Differentiate between an hydrated and a dehydrated crystal.

1-2. Define the term pressure.

2-3. Name two chemical properties of water 1._____

2._____.

2-4. Name two physical properties of water.1._____

2._____

3-5. List the boiling point of water on the centigrade scale

_____ fahrenheit scale_____

3-6. List the freezing point of water on the fahrenheit scale

_____ centigrade scale_____

4-7. How does solutes affect the boiling point of water?

4-8. How does solutes affect the freezing point of water?

5-9. How does the reduced pressure affect the boiling point of boiling water?

6-10. Name two chemicals that contains water of hydration.

1._____ 2._____

7-11. Explain how you can hydrate a dehydrated crystal.

7-12. Explain how you can dehydrate some hydrated crystals.

Advanced Study

____ 1. Prepare a chart listing the names of at least five crystals which contains water of hydration.

____ 2. Prepare a poster which displays some physical and chemical properties of water.

____ 3. Prepare a report on how solutes effect the boiling and freezing point of water.

____ 4. Prepare a report on the advantages of using a pressure cooker.

____ 5. Prepare a write-up of how the temperature of water effects solids and gases in solution.

Experiment I

The Effects of Reduced Pressure on Boiling Water

1. Materials needed:

   1. hot plate

   2. florence flask

   3. water

2. Procedure:

Fill the florence flask about half full of water; turn the hot plate control to medium high heat; bring the water to a full boil. Carefully plug the flask with a tightly fitting stopper.

Using tongs remove the flask with the water from the hot plate. Note what happens. Then turn the flask upside down and place a wet folded paper towel against the bottom.

Explain what happens:

Why?

Conclusion: How does reducing the pressure effect the boiling point of water?

Experiment II

I.Dehydration of hydrated crystals

II. Materials needed:

1. copper sulfate crystals
2. test tube
3. test tube clamp
4. propane torch

III. Procedure:

Put two large copper sulfate crystals into a test tube and heat gently on the propane torch. Hold the test tube horizontally.

What collects inside the test tube as it is heated?_____

_____. Continue heating. What happens?

_____

Examine the materials that remains. Describe_____

How has the color of the crystals changed?_____

What else has changed?_____

Conclusion:_____

_____

Note: Keep these dehydrated crystals for the next experiment on hydrating and dehydrating a crystal.

Experiment II (cont)

I. Hydrating copper sulfate crystals

II. Materials Needed

1. dehydrated copper sulfate crystals
2. Test tube
3. water
4. medicine dropper

III. Procedure

Return the dehydrated copper sulfate crystals just prepared to a test tube. Add a drop of water. What happens?_____

_____

What color changes take place?_____

Add about ten drops of water. What happens?

Examine the crystals. Have new crystals formed?_____

Explain._____

_____

_____

_____

Section II

Behavioral Objectives

Using the resources prescribed you will on the progress and/or LAP Test:

1. Define the following terms:
   a. solute
   2. solvent
   3. solution
   4. soluble
   5. diffusion
2. Name the three basic types of solutions by concentration.
3. State the difference between dilute, saturated and concentrated solutions.
4. List four ways to make common solutes dissolve faster in a solvent.
5. Identify the solutes and solvents in given solutions.
6. List the names of four common solvents and four common solutes.
7. State the principle cause of diffusion.
8. State whether gases are more soluble in cold or hot water.
9. State whether most common solids are more soluble in cold or hot water.

Resources

___ 1. World Book Encyclopedia vol. 17 book 3 page 478

___ 2. Cambridge Work-A- Text Physical Science pages 182-183.

___ 3. Exploring Physical Science page 26-30 and 30-31

___ 4. Modern Physical Science pages 17-18

___ 5. Pathways In Science pages 18-45

Handouts:

I. Common Solvents

II. Common Solutes

III. Combining solutes and solvents and forming solutions

IV. Identification of solutes and solvents from given substances.

Tape:

Lecture: Nature of solutions

Experiments:

1. Making a Solution

2. Making a dilute, concentrated and a saturated solution

3. Making solutes dissolve faster in a solvent

Experiment III

I. Making A Solution

II. Materials Needed:

1. table salt
2. test tube
3. water
4. sugar
5. stirrer

III. Procedure:

Place a teaspoon full of salt in the test tube. Fill the test tube 3/4 full with water. Use your stirrer and stir the solution.

What is the name of the process which is going on within the test tube?_____

What was the solvent?_____

What was the solute?_____

What type of solution was formed?_____

Repeat the experiment using sugar instead of salt.

What was the solvent?_____

What was the solute?_____

What type of solution was formed?_____

Experiment IV

Making dilute, concentrated and saturated solutions.

Materials Needed:

1. salt
2. test tube
3. water
4. stirrer

Procedure:

Put a few grains of salt in a test tube of cold water. Stir the mixture. Is this a dilute concentrated or saturated solution?_____

Add about a 3/4 teaspoon of salt to a test tube that is 3/4 filled with water. Is this a dilute, concentrated or saturated solution?_____ Continue adding salt to the same test tube above until no more salt will dissolve and visible particles of salt are noted at the bottom of the test tube. Is this a dilute, concentrated or saturated solution?

_____

Experiment VI

I. Making thing dissolve faster in a solvent

II. Materials Needed

1. two beakers
2. spoon
3. mortar and pestle
4. hot plate
5. granular sugar
6. cubed sugar
7. cold water
8. warm water

III. Procedure:

1a Put a tablespoon of sugar into each of the two beakers. Stir one but do not stir the other. Which one dissolves faster? _____ Pour these solutions out and dry the beakers.

1b Put one cube of sugar in each of the two beakers. Crush one cube into a powder, fill each of the beakers half full of water. Stir each one the same number of times. Which dissolves faster?_____ Again clean and dry beakers.

1c. put a tablespoon of sugar in each of the two beakers. Add a cupful of cold water to one beaker and a cupful of hot water to the other beaker. Stir each mixture the same number of times. Which dissolves faster?_____ Clean up the equipment that you have used for the next group to use.

List three ways in which the dissolving process might be speeded up.

1.

2.

3.

Self-Evaluation

1-5. Identify the solute, solvent and solution in the following equation.

Water + sugar $\longrightarrow$ sugar water

_____ _____ _____

2-2. By concentration name the three basic types of solution.

1._____ 2._____

3._____

3-3. By observation how can you tell when you have a saturated solution?_____

4-4. Name three ways you can make a solute dissolve faster in a solvent.

1.

2.

3.

5-6. List the names of four different solvents

1. 2.

3. 4.

6-6. List the names of four different solvents

1. 2.

3. 4.

7-7. The principle cause of diffusion is the motion of_____

8-8. Are gases more soluble in cold or warm solvents? _____

9-9. Are most common solutes more soluble in warm or cold water?_____

10-1. Define the following terms: 1. solute 2. solvent 3. solution.

Advanced Study

____ 1. Make a poster displaying four ways to make common solutes dissolve faster.

____ 2. Construct a chart which displays equations for some common solutes and solvents forming common solutions.

____ 3. Prepare a report and/or a demonstration showing the difference between a solution on a suspension.

____ 4. Construct a chart displaying the names for several common solutes and solvents.

____ 5. Prepare a report on the solubility of gases in liquids.

Section III

Behavioral Objectives

Using the prescribed resources listed you will on the progress and/ or LAP Test:

1. List the 6 basic steps in the purification of water.

2. State the difference between hard and soft water.

3. Name one of the chemicals that cause hardness in water.

4. State two disadvantages of using hard water.

5. Name three chemicals that can be used to soften hard water.

6. Demonstrate how we can prepare some hard water in class and soften the hard water.

Resources

____ 1. Modern Physical Science pages 73-77

____ 2. Cambridge Work-A- Text Physical Science pages 183-184

____ 3. The Book of Popular Science pages 276-281

____ 4. Pathways In Science pages 76-84

____ 5. The World Book Encyclopedia pages 102-103

Handouts.

I General Information About Water (matching exercise)

Tape: Lecture: Water Purification

Experiments:

1. Making Hard Water
2. Softening Hard Water
* 3. Distilling(purfying) some Water
   * Demonstration: Distilling Water

Activities

1. Using the Modern Physical Science textbook page 82 answer the following questions; 6, 7, 8, 9 and 10.

Self-Evaluation

1-1. Complete the six steps for the purification for water.

1. Settling in first basin
2.
3. filtration
4.
5.
6. fluoridation

2-2. By observation how can you tell when you have hard water?

3-3. (True or False) Calcium and/or magnesium ions can cause hardness in water.

4-4. Name a disadvantage for using hard water.

5-5. Name some chemicals that can be used to soften hard water.

1._____ 2._____

6-6. Explain how you might prepare the following in class.

Hard water: (procedure)

Soften some hard water: (procedure)

Experiment VI

Making Hard Water

I. Materials Needed

1. Calcium sulfate (plaster of paris)

or

2. Magnesium sulfate (epsom salt)

3. Quart Jar

4. Teaspoon

II. Procedure:

Dissolve 1 teaspoon full of either calcium sulfate or magnesium sulfate in a quart of water. (If possible use magnesium sulfate it dissolves better than calcium sulfate). Stir the solution thoroughly.

Measure out 25 ml of this solution and pour it in a beaker lable the beaker hard water.

To the beaker of hard water add three drops of soap solution.

Describe the amount of suds that is formed after stirring the hard water and soap solution._____

_____

Save your hard water you will need it for the next experiment. (softening hard water).

Experiment VII

Softening Hard Water

Materials Needed

1. Hard Water
2. soap solution
3. Test tube
4. cork
5. graduated cylinder
6. washing soda
7. borax

Procedure:

Take the test tube and add about 10 ml of hard water, then into the same test tube place a pinch of borax, and about three crops of soap solution. Place the cork in the test tube and shake thouroughly.

Describe the amount of suds that were formed in the tube after shaking._____

What causes the hard water to soften?_____

What is the chemical name for borax?_____

washing soda_____

INVESTIGATION 2-1 PURIFICATION OF WATER

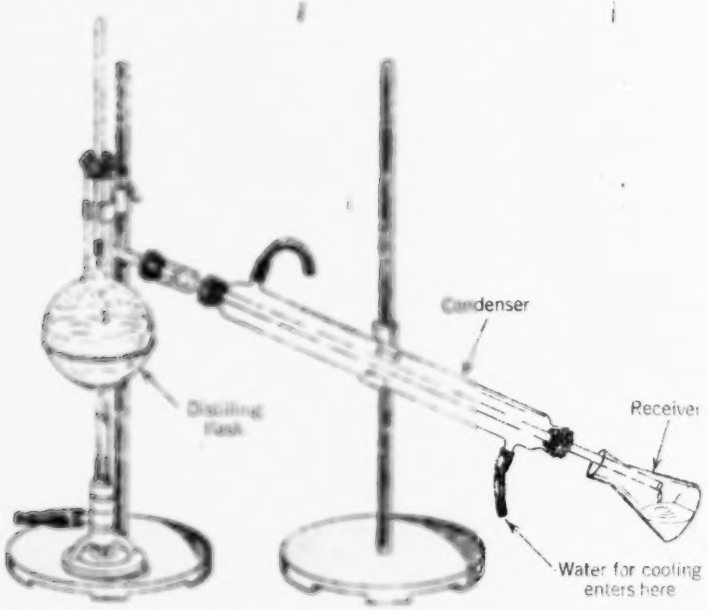
PROBLEM: To demonstrate the purification of water by distillation.

MATERIALS: A 500-ml distilling flask, one-hole rubber stopper to fit; condenser with one-hole stopper to fit; 2 iron clamps, 2 ring stands, thermometer; wire gauze, rubber tubing for condenser; graduated cylinder, 250-ml beaker; 2 watch glasses, about 3" diameter; 250-ml receiving flask, Bunsen burner, small crystals of copper (II) sulfate.

INVESTIGATION: In the distillation process, the liquid is converted into a vapor by heating it to its boiling point. The vapors are then led through a tube to another vessel called a condenser. Usually running water is used in the condenser to cool the vapors. This causes the vapors to condense to a liquid again. The distilled liquid is then collected in a suitable receiving container.

Many liquids, such as water, gasoline, alcohol, and turpentine are purified by distillation. At the present time, it would be too costly to distill the drinking water for a large city. However, distilled water is used for storage batteries, steam boilers, and for other industrial purposes.

PART 1 Set up the apparatus as shown below. To the flask containing 200 ml of tap water, add 1/4 teaspoonful of copper (II) sulfate crystals. As the solute dissolves to form a blue solution, it is quite evident that you are starting with water that is not pure.



Heat to boiling the copper salt solution in the flask. Note the temperature of the vapors that leave the distillation flask. Trace the path the vapor from the boiling liquid follows from the distilling flask through the condenser into the receiver. Throw out the first few milliliters of water that distill over. Then continue the distillation until about 50 ml of distilled water has been collected. Notice the absence of a blue color in the distilled liquid. You may desire to taste the distilled water if the container has been properly cleaned.

Advanced Study

____1. Make a poster displaying the 6 major steps for purifying water.

____2. Make a model display showing the process for purifying water.

____3. Make a report on the "Causes of Hard Water"

____4. Prepare a chart using chemicals which can be used to soften hard water.

____5. Demonstrate to the class ways for detecting "Hard Water."

____6. Demonstrate to the class 2 methods for softening hard water.

Section IV

Behavioral Objectives

Using the prescribed resources you will on the progress and/

or LAP Test:

1. Name the two basic elements of which water is composed

2. Construct a chart entitled research on oxygen. The chart will include the following information about oxygen:

   a. name of element (oxygen)
   b. symbol of the element
   c. atomic weight of the element
   d. atomic number of the element
   e. electronic configuration for the element
   f. physical properties
   g. chemical properties
   h. uses
   i. method of preparation

3. Construct a chart entitled research on the element hydrogen: The chart should include the following information about the element hydrogen.

   a. name of element (hydrogen)

   b. symbol for element

   c. atomic weight

   d. electronic configuration

   e. atomic number

   f. physical properties

   g. chemical properties

   h. uses
   i. method or preparation

4. Prepare a laboratory write-up on how oxygen can be prepared in class.

5. Prepare a laboratory write-up on how hydrogen can be prepared in class.

6. Differentiate between rapid oxidation and slow oxidation.

7. List two examples of rapid and slow oxidation.

Resources

___ 1. Modern Physical Science pages 34-37 (information on oxygen).

pages 43-44 (information on hydrogen)

___ 2. Pathways In Science (oxygen) pages 87-97

(hydrogen) 32-40 and 60

___ 3. World Book Encyclopedia book O Topic: Oxygen

volume 14 pages 679-680

___ 4. World Book Encyclopedia Book H Topic: Hydrogen

volume 9 page 413

___ 5. Energy and The Atom pages 270-274 Topic: The Discovery of Oxygen

Handouts:

1. Chart To Complete on Oxygen
2. Chart To Complete on Hydrogen

Filmstrips:

Oxygen and Hydrogen

Group Hydrogen Oxygen and Water

Tape: Lecture-1 The Nature of Hydrogen and Oxygen.

Demonstration: Experiment-

1. Preparation of Hydrogen
2. Preparation of Oxygen

Self-Evaluation

1-1. Name the two elements which makes up water_____
and _____.

2-2. List two physical properties of oxygen.1._____
2._____.

3-2. List two chemical properties of oxygen.1._____
2._____

4-2. List two uses for oxygen.1._____
2._____

5-4. What two compounds did we combine to prepare oxygen in class. _____ and_____

6-4. The method which we used to collect oxygen was the _____ method.

7-3. List two uses for hydrogen. 1._____
2._____

8-3. List two chemical properties for hydrogen. 1._____
2._____

9-3. List two physical properties of hydrogen. 1._____
2._____

10-5. Name the two chemicals that were used to prepare hydrogen _____ and_____.

11-5. The method we used to prepare hydrogen was called_____ _____ method.

12-6. Differentiate between rapid and slow oxidation.
rapid oxidation_____
slow oxidation_____

13-6. Give an example of slow oxidation._____

14-6. Give an example of rapid oxidation_____

Advanced Study

____ 1. Prepare an enlarged chart on poster board with research information on oxygen and/or hydrogen.

____ 2. Prepare a chart on how you set up apparatus to collect oxygen and/or hydrogen.

____ 3. Prepare a report on rapid and/or slow oxidation.

____ 4. Assemble a display of items which has undergone the slow oxidation process.

____ 5. Present to the class a report on hydrogen and/or oxygen.

____ 6. Prepare a chart listing some uses for oxygen and/or hydrogen.

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U.S. DEPARTMENT OF HEALTH
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LAP

LEARNING
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PACKAGE

INTRODUCTION TO ACIDS, BASES AND SALTS

Ninety Six High School
Ninety Six, S.C.

PHYSICAL SCIENCE 93-94

REVIEWED BY

LAP NUMBER 6

WRITTEN BY G. J. Williams

SE 016 423

Rationale

Lets make some table salt and test some substances for acidic and basic properties. But first we will need to direct our attention to the interesting study of acids, bases and salts.

Perhaps, you feel you are not already acquainted with some of the information in this LAP. But you use some acids, bases and salts right in your own home; for instance what type of acid is found in aspirin, buttermilk, tea and lemons? What is the common name for the base $Mg(OH)_2$? Write the formula for sodium chloride(table salt).

Upon completing this LAP you will be able to answer each of the questions stated above, also how to make table salt using an acid and a base.

Our next LAP will deal with the study of a very interesting element carbon. We will study about its properties, forms and uses.

Section I

Behavioral Objectives

Using the prescribed resources listed, you will on the progress and/or LAP test be able to:

1. State four properties of an acid and interpret their meaning.
2. List the formula for five common acids.
3. Identify the names of acids from given formulas.
4. List the names of five foods which contains an acid and give the name of the acid that the food contains.
5. Demonstrate three ways an acid can be identified.
6. Classify given acids as either strong or weak.
7. State the property which classifies an acid as strong or weak.
8. Name four acids and give three uses for each.

Resources

Modern Physical Science

Topic: Acids, Bases and Salts

pages 45-55

Cambridge Work A Text

Physical Science

Topic: Acids, Bases and Salts pages 191-192

Pathways In Science

Book 2-Chemistry of Mixtures

Topic-Compounds Called Acids pages 96-101 and 118-122

Energy and the Atom

Topic-Acids, Bases,Salts pages 94-98

Hand-outs

1. Names of Acids to Give Formulas
2. Formulas of Acids to Give Name
3. Matching exercise on - Naming the acid within given substances.

Tapes and Audio Visuals:

1. Wollensak Tape: Molecules and Compounds
2. Transparency: Acids, Bases, Salts

Activities (laboratory-work)

1. Experiment I- Acid Indicators
2. Demonstration- Testing Substances for Acidity

Self-Evaluation Quiz

No.	Obj.	
1	1	Identify the properties of an acid. a. bitter taste b. release hydronium ions c. turn blue litmus red d. turn red litmus blue
2	3	Match the formula with the proper name. _____ $HC_2H_3O_2$ a. nitric acid _____ HCl b. acetic acid _____ HNO_3 c. hydrochloric acid _____ H_2CO_3 d. carbonic acid
3	2	Write the formula for the following acids. _____ Boric acid _____ phosphoric acid _____ sulfuric acid
4	6	Classify the following acids as either strong or weak acids 1. carbonic acid_____ 2. sulfuric acid_____ 3. boric acid _____ 4. nitric acid _____
5	4	Match the following with the acid it contains. ____1. vinegar a. boric acid ____2. aspirin b. acetic acid ____3. lemon c. acetyl salicylic ____4. buttermilk d. lactic ____5. apple e. mallic ____6. eye wash f. citric
6	5	Name two indicators for an acid. 1. 2.

7. 8 It is the concentration of_____ ions which determines whether an acid will be strong or weak.

8 9 Name two acids and state two uses for each acid you name.

Advanced Study

____1. Prepare a write-up of how the following acids can be prepared in the laboratory:
(1) hydrochloric acid
(2) acetic acid
(3) nitric acid

____2. Write an explanation of how an hydronium ion differs from the hydrogen ion.

____3. Find out what two substances are formed when hydrochloric acid reacts with the metal zinc. Write the equation for this reaction.

____4. Explain to the class what is meant by "PH scale" and what the numbers on the PH scale indicate.

____5. Write an explanation for what occurs when sugar and sulfuric acid react together.

Experiment I

Acid Indicators

Materials Needed

1. Blue litmus paper
2. acid (acetic acid-vinegar)
3. salt solution(neutral solution)
4. ammonia(household ammonia-base)
5. 3 beakers
6. platform balance
7. graduated cylinder
8. lable-on tape

Procedure

Get three beakers from the cabinet and place lable-on tape on them. Lable the beakers: beaker 1, beaker 2 and beaker 3.

In beaker 1, place 5 ml of acetic acid(vinegar). In beaker 2 place your salt solution(composed of 5 grams of table salt and 10 ml of water). In beaker 3 place 5 ml of dilute household ammonia solution.

Record your data as follows:

Data

Beaker No.	Solution	Color change
1	acetic acid	
2	salt solution	
3	ammonia solution	

Conclusion- What is the name of an indicator for acids_____

What color will blue litmus paper turn in the presence of an acid?_____

Research

What color will phenolphthalein turn in the presence of an acid?_____

Is phenolphthalein considered an indicator for acids?_____

Record of Data

Demonstration: Testing substances for acidic, basic or neutral properties

Substance	Acidic	Basic	Neutral
Buttermilk			
Tomatoes			
Dish detergent			
Lemon			
Orange juice			
Apple			
Vinegar			
Aspirin			
Soda pop			
Milk of magnesia			
Epsom salts			
Alum solution			
Table salt solution			
Baking soda solution			
Sugar solution			
Ammonia			
Lye Solution			
Limewater			

Section II

Behavioral Objectives

Using the prescribed resources listed you will on the progress and/or LAP test be able to:

1. State four properties of a base and interpret their meaning.

2. List the formula for five common bases.

3. Identify the names of five bases from given formulas.

4. List the common names, chemical name and give the formula for five common bases which are commonly used in our homes.

5. State the property which classifies a base as a strong base or weak base.

6. Classify given bases as strong or weak.

7. List the names of four bases and give three uses for each.

8. Demonstrate two ways to identify a base.

Resources

Cambridge Work-A-Text

Physical Science

Topic: Acids, Bases, And Salts pages 192-193

Modern Physical Science

Topic: Hydroxides are bases pages 55-58

Pathways In Science

Book 2-Chemistry of Mixtures

Topic: Compounds Called Bases pages 102-106 118-122

Energy and the Atom

Topic Acids, Bases, Salts pages 94-98

Handouts

1. Names of bases to give formulas
2. Formulas of bases to give names
3. Classifying common and chemical names four some common household substances which are bases

Tapes and Audio Visual

2. Transparency-Acids, Bases, Salts
3. Filmstrip-Acids and Bases

Activities(Laboratory)

1. Experiment II: Base Indicators
2. Demonstration: Testing substances for basic properties

Self-Evaluation

No.	Obj.	
1	1	Interpret the meaning for the following properties of a base. 1. Neutralize acids_____ 2. Caustic action on wool_____ 3. Hydroxide ion_____
2	2	Match the formula with the name of the base. 1.___ Sodium Hydroxide a. NH_4OH 2.___ Magnesium hydroxide b. NaOH 3.___ Calcium hydroxide c. $Mg(OH)_2$ 4.___ Ammonium hydroxide d. $Ca(OH)_2$
3	3.	Write the formula for the following bases. 1. Aluminum hydroxide_____ 2. Potassium hydroxide_____
4	4 ,	Give the chemical name for the following bases. 1. Devils lye_____ 2. Milk of Magnesia_____ 3. Lime water_____ 4. household ammonia_____
5	5	_____ is the property which determines whether a base is strong or weak.
6	6	Classify the following bases as strong or weak.
7	6	1. ammonia hydroxide_____ 2. sodium hydroxide_____ 3. magnesium hydroxide_____ 4. potassium hydroxide_____
8	7	Name one use for the following bases. 1. sodium hydroxide_____

2. ammonium hydroxide_____

3. calcium hydroxide_____

4. potassium hydroxide_____

9 8 Name two indicators of a base.

1._____

2._____

Experiment II

Base Indicators

Materials Needed

Note: Use the same materials listed for experiment I, except use red litmus paper instead of blue litmus.

Procedure

Use the same procedure as given for experiment I

Record the data as follows:

Beaker Number	Solution	Color Change
1	Acetic acid	
2	Salt solution	
3	Ammonia solution	

Conclusion

What is the name of an indicator for bases_____

What color will red litmus turn in the presence of a base?

Research

What color will phenolphthalein turn in the presence of a base?

Advanced Study

List the names and state several uses for bases in the field of agriculture.

Prepare a display on the significance of bases in our daily life.

Prepare illustrations which displays several general properties of bases.

Prepare a list composed of the chemical and common names of several bases which we use in our home.

Prepare a report composed of research you have done on a particular base which interest you most.

See Your Teacher for your point of interest.

Section III

Behavioral Objectives

Using the prescribed resources listed you will on the progress and/or LAP test be able to:

1. Distinguish a salt from acids and a bases.
2. State the general equation for the preparation of salts.
3. State how table salt can be prepared in the laboratory.
4. List the name and formula for five different salts.
5. Identify the names of five salts from given formulas.
6. Select the acid and base which combine the form given salts.
7. Classify given salts as acidic, basic or neutral.
8. Write equations for the preparation of given salts.
9. Demonstrate how you can determine whether a salt is acidic, basic or neutral.
10. List the names of five salts and give two uses for each.

Resources

Pathways In Science

Book 2 Chemistry of Mixtures

Topic: When An Acid Meets Base pages 107-110 118-122

Cambridge Work A- Text

Physical Science

Topic: Acids, Bases, and Salts

pages 193-194

Modern Physical Science

Topic-What are Salts pages 57-65

Energy and the Atom

Topic: Acids, Bases, Salts pages 94-98

Handouts

1. Equations consisting of given acids and bases to complete with the salt which is formed and water.

2. Names of salts to determine which acid and base combined to form it.

3. Formula of salts to determine whether the salt is acidic, basic or netral.

4. Formulas of salts to submit names of salts and to submit formulas.

Tapes and Audio Visuals

Tape: Lecture "Acids and Bases Form Salts"

Activities(Laboratory-Demonstration)

* 1. Preparation of Table Salt

* 2. Testing salts for acidic basic and neutral properties.

Experiment III

Testing Salts for Acidic, Basic, and Neutral Properties.

Materials Needed

1. Five beakers
2. Label-on tape
3. Table Salt Solution
4. Potassium chloride solution
5. Calcium sulfate solution
6. Sodium acetate solution
7. Ammonium chloride solution

Procedure-

Arrange your beakers in order 1-5 place a label on each beaker and place one of the names of the salt solutions listed above on each beaker. Measure out 5 ml of each solution and test each solution with both red and blue litmus paper. Record your data as follows.

Name	Acidic	Basic	Neutral
1. NaCl			
2. KCl			
3. $CaCO_3$			
4. $NaC_2H_3O_2$			
5. NH_4Cl			

Place a check in the appropriate column

Self-Evaluation

No.	Obj.	
1	1	Identify the salt, acid and base $NaOH + HCl \longrightarrow NaCl + H_2O$
2	2	Write the general equation for the preparation of salt.
3	3	Briefly explain how salt was prepared in the lab.
4	4	Write the name and formula for four salts. Name — Formula 1 2 3 4 5
5	1	Classify the following as either acid, base or salt. 1. NaCl_____ 3. NaOH_____ 2. HCl_____ 4. $CaCl_2$_____
6	8	Classify the following salts as acidic, basic or neutral salts, and give the name of the salt. 1. $CaCl_2$_____ _____ 2. NaCl_____ _____ 3. NH_4SO_4_____ _____ 4. $NaC_2H_3O_2$_____ _____
7	7	Give the name of the acid and base which could be combined to form the following salts Salt — Acid — Base 1. NaCl 2. $CaSO_4$ 3. NH_4Cl 4. KNO_3
8	9	Write the chemical equation for the preparation of the salt K_2SO_4.
9	11	Give two uses for the following salts. 1. $MgSO_4$ 2. KNO_3 3. NaCl 4. KCl

Advanced Study

1. Prepare a report on salt and include in the report something about each of the following topics:

    1. How Salt is Used
    2. Where Salt comes From
    3. Salt as a Chemical
    4. Salt Production

2. Prepare a display which shows five different uses for salt.

3. Prepare a write-up on how salt affects the freezing point of water. Include in write-up

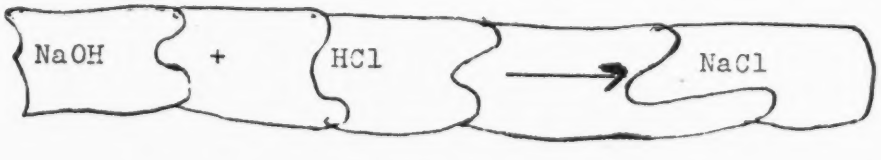
    (1) Why salt is often used on snowy and icy roads

    (2) Why is salt added to ice in the churn when freezing ice cream.

4. Construct puzzles composed of acids, bases combining to form salts.

    (note)Make all acids one shape to connnect in with the bases and all bases one shape to fit into the shape for your salts.

    Idea!!



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LAP

LEARNING
ACTIVITY
PACKAGE

CARBON and its COMPOUNDS

Ninety Six High School - Ninety Six, S.C.

PHYSICAL SCIENCE 93-94

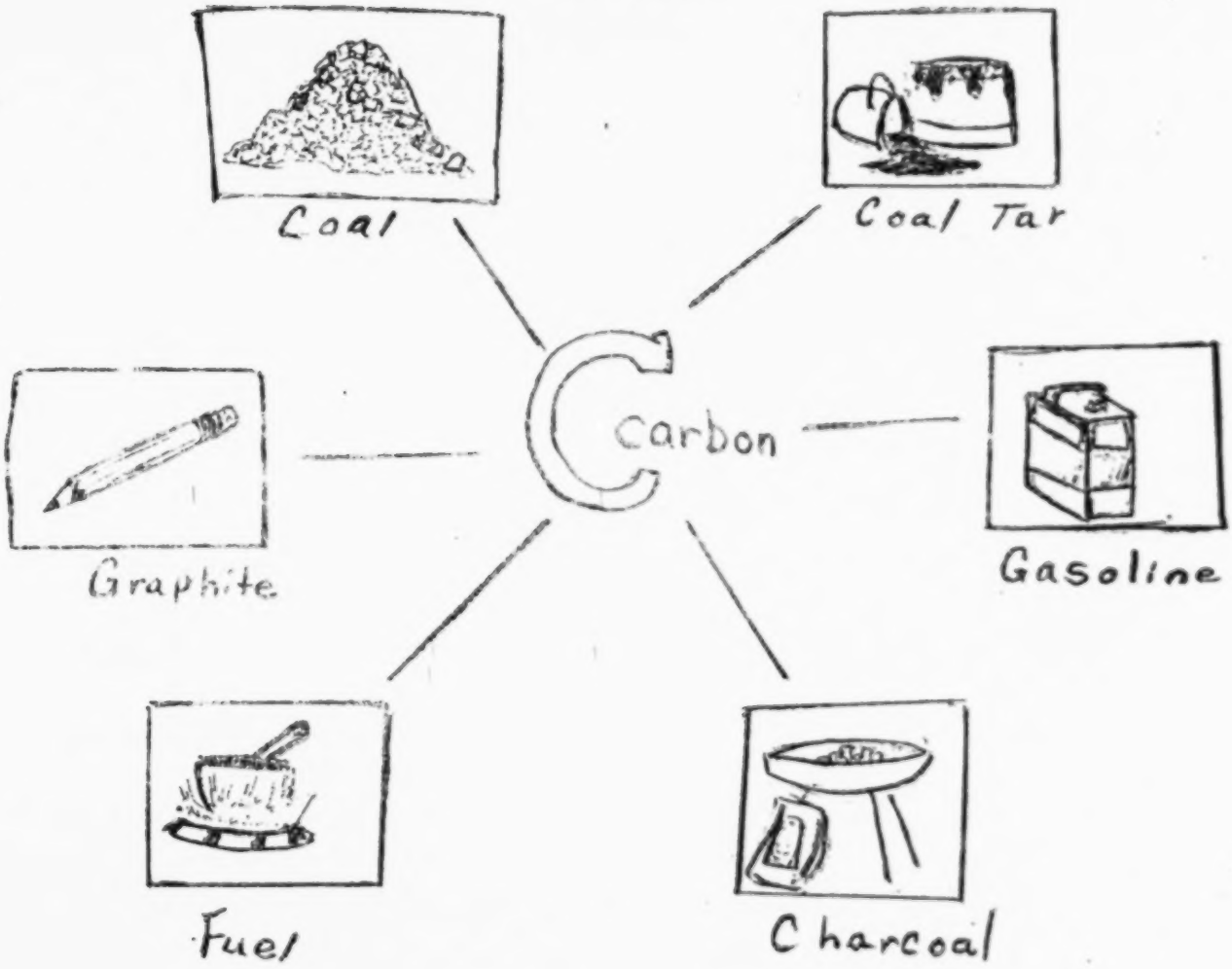
REVIEWED BY _____

LAP NUMBER 7

WRITTEN BY G. J. Williams

SE 016 423

Rationale



Again, students we are about to foretake another very interesting adventure. You have just completed a LAP on the study of Acids, Bases and Salts. We are now going to venture into a wide realm of information about the element carbon.

Carbon is one of the most important chemical elements. This is why we are going to dedicate the information in this LAP to the study of this element. We will consider the Properties, Forms, and Compounds of carbon in this LAP.

Study the diagrams above. How do they relate to the element carbon?

Our next LAP will take us on another wild adventure. We will undertake the study of atomic radiation.

Section I

Behavioral Objectives

Using the prescribed resources you will on the progress and/or LAP test be able to:

1. State four chemical and physical properties of the element carbon.
2. Demonstrate how the purest form of carbon in nature can be prepared in the laboratory.
3. Give a description of pure carbon.
4. State the names and be able to identify the amorphous forms of carbon.
5. Demonstrate how the amorphous forms of carbon can be prepared in the laboratory.
6. Identify the original substances from which the amorphous forms of carbon can be prepared.
7. Identify the names of five compounds which contains the element carbon.
8. Distinguish between given amorphous and crystalline forms of carbon.

Resources Section I

_____ A. World Book Encyclopedia; Volume C - Topic Carbon, page 167 - 168 (1970 edition)

_____ B. Exploring Physical Science
Page 81 - 86.

_____ C. Pathways in Science
Page 41; Topic: Carbon, The Life Element

_____ D. General Chemistry
Topic: Part 1: Carbon
Pages 333 - 335

Hand-out(s)

1. List of terms to define related to the study of carbon

2. Chart to complete on the properties of carbon

Tape(s) - Audio-visual(s)

Wallensak (Tape): The Element Carbon
(Complete the worksheet)

Activities

After completing learning goals 1-6 section 1, check with your teacher for an assigned activity, before going to learning goals 7 - 8.

Demonstration (laboratory)

1. Preparation of the Amorphous Forms of Carbon

2. Preparation of pure carbon

Self Evaluation -Section I

1. Give the meaning, one use, and means of preparation for four of the amorphous forms of carbon:

I. Name Definition

1. _____ _____
2. _____ _____
3. _____ _____
4. _____ _____

II. Name Use

1. _____ _____
2. _____ _____
3. _____ _____
4. _____ _____

III. Name Means of Preparation

1. _____ _____
2. _____ _____
3. _____ _____
4. _____ _____

IV. List three properties of carbon

1. _____ 2. _____ 3. _____

V. Name three compounds which contain carbon:

1. _____ 2. _____ 3. _____

Self Evaluation - Section I

VI. Give a complete description of pure carbon.

VII. Classify the following as either amorphous, or crystalline forms of carbon.

_____ Graphite _____ Carbon black

_____ Boneblack _____ Diamond

Advanced Study

_____ 1. Using at least one of the following topics, prepare a written report, using four different reference books.

1. Carbon as an Element
2. Amorphous Forms of Carbon
3. Properties of Carbon
4. Crystalline Forms of Carbon

_____ 2. Prepare a poster which illustrates the Amorphous forms of carbon and how they can be prepared and/or the uses for each of the amorphous forms.

_____ 3. Prepare a display of pictures of objects or substances that in some way is related to the study of carbon.

Section II

Behavioral Objectives

Using the prescribed resources you will on the progress and/or LAP test be able to:

1. State the relationship between diamond and graphite to the element carbon.
2. State how scientists propose that diamonds are formed in nature, and can be prepared artificially.
3. List the names of the compounds formed when diamonds are heated in both the presence and absence of the element oxygen.
4. Identify the properties of diamonds.
5. Give a description of a diamond when it is first taken from the ground.
6. Differentiate between the arrangement of carbon atoms in diamond and graphite, and state how diamonds and graphite are similar and different.
7. Give a complete description of graphite as it occurs in nature; include its composition, appearance and properties.
8. Name four common uses for graphite.

Self Evaluation - Section II

1. Diamond and graphite belong to the _____ form of carbon.
2. A diamond (will, or will not) dissolve in an acid?
3. A diamond (can, or cannot) be destroyed with intense heat?
4. Diamonds are crystals formed almost entirely of the element _____.
5. If diamonds are heated in the presence of oxygen the compound _____ is formed.
6. If diamonds are heated in the absence of oxygen,_____ is the name of the compound that is formed.
7. Describe graphite as it occurs in nature:

8. List two properties of graphite:

9. List two uses for graphite:

_____ and _____

10. Name the basic element of which graphite is composed.

_____.

11. What is the basic difference between diamonds and graphite?

12. How are diamonds and graphite similar?

Resources

1. World Book Encyclopedia
   Volume D - pages 147-149
   Topic: Diamond

2. Modern Physical Science
   Topic(s): Diamond and Graphite
   Page(s) 274-275

3. World Book Encyclopedia
   Volume G - page 315
   Topic: Graphite

4. Cambridge Work - A - Text
   Physical Science
   Topic(s) (1) Diamond
   (2) Graphite
   Pages 207-208

Handout(s)

1. Information to complete on diamonds
2. Information to complete on graphite

Lecture

Diamonds and Graphite

Activities

Check with your teacher for an assigned activity before starting on Section II.

Advanced Study

1. Make a diagram illustrating the difference between the arrangement of carbon atoms in diamonds and graphite.

2. Make a chart displaying the similarities and differences. between diamond and graphite.

3. Make a report on either of the following topics:

    1. Diamond
    2. Graphite

    Use five different references to make up the content of your report.

4. Make a display showing five different uses for diamond and five different uses for graphite.

5. Make a report on how diamonds can be made artificially.

Section III

Behavioral Objectives

Using the prescribed resources you will on the progress and/or LAP test be able to:

1. State the relationship of the element carbon to the study of hydrocarbons.
2. Identify the names for the first ten members of the alkane, alkene and alkyne series of hydrocarbons.
3. State the basic formula for determining the general formulas for the members of the alkane, alkene and alkyne series of hydrocarbons.
4. Using the general formulas, construct the structural formulas for members of each of the series of hydrocarbons.
5. List at least two uses for any two members of each of the series of hydrocarbons.
6. Demonstrate how the hydrocarbon, Methane, can be prepared in the laboratory.

Resources

1. Modern Physical Science
   Topic: The Alkane Series
   Page(s) 132 - 135
2. Energy and the Atom
   Topic(s): Organic Chemistry
   Page(s) 99-102
3. Exploring Physical Science
   Pages 86-87 and pages 90-92

Resources (con't)

4. World Book Encyclopedia

Topic(s): 1. Hydrocarbon
2. Aliphatic Hydrocarbons
3. Alicyclics
Pages 411 - 412

5. General Chemistry

Topic: Part 1: The Hydrocarbons

Pages 547-551

Handout(s)

I. Names and basic formulas for members of the Alkane, Alkene and Alkyne series of hydrocarbons.

II. General formulas and structural formulas for members of the alkane, alkene and alkyne series of hydrocarbons.

Lecture:

I. The hydrocarbons.

Demonstration:

I. How to construct structural formulas for members of the alkanes, alkene and alkyne series of hydrocarbons.

Experiment: (Demonstration)

Preparation of methane (a hydrocarbon)

Instructions - page 98 - of Exploring Physical Science.

Wall Chart:

"Chemistry of Petroleum Refining"

Activities

Check with your teacher after you complete each of the stated learning goals in Section III.

Learning goals: 2. (See teacher)
3. (See teacher)
4. (See teacher)

Advanced Study

1. Make an illustration showing the name, basic formula, general formula and structural formula for either member of either series of hydrocarbons.

2. Make a display showing items that we enjoy due to the hydrocarbon compounds.

3. Make a laboratory write-up on how we can prepare some acetylene in the laboratory.

4. List the names of some substitution products that results by substituting other elements on the hydrocarbon Main Chain.

5. Make a report on either of the following topics:
   (1) Hydrocarbon
   (2) Benzene
   (3) Methane
   (4) Octane
   (5) Heptane

   Use five different references to make up the content of your report.

Self Evaluation Quiz - Section III

I. _____ are compounds composed of the elements carbon and hydrogen.

II. Name three series of hydrocarbon:

1. _____

2. _____

3. _____

III. Name the series of hydrocarbons and give the basic formula for determining the general formulas for members in each series:

Series	Basic Formula
1. _____	_____
2. _____	_____
3. _____	_____

IV. If N=5 determine the general formula for each series of hydrocarbons.

Series	General Formula
1. _____	_____
2. _____	_____
3. _____	_____

V. Using the general formulas stated in question (4), construct the structural formula for each of the series.

General Formula	Structural Formula
1. _____	_____
2. _____	_____
3. _____	_____

Self Evaluation Quiz (con't)

VI. List names and use for two members of any series of hydrocarbon.

Name	Use
1. _____	_____
2. _____	_____

Section IV

Behavioral Objectives

Using the prescribed resources, you will on the progress and/or LAP test be able to:

1. State the relationship between the element carbon and petroleum.
2. Describe petroleum (crude oil) include the names of the elements it contains.
3. Identify the names of five products which can be obtained from the fractional distillation of crude oil.
4. Name and define three instruments which can be used to detect oil deposits.
5. State the name and content of the theory which best explains the origin of petroleum.
6. Differentiate between the procedures used to (a) detect oil deposits and (b) refine crude oil.
7. Distinguish the functions of the parts of fractional distillation apparatus used to refine crude oil.

Resources - Section IV

1. Modern Physical Science

   Topics: Petroleum

   Page(s) 129-140

2. Exploring Physical Science

   Topic: Oil Refineries

   Page(s) 90-92

3. Science: A Key to the Future

   Topic: Petroleum

   Pages 554-444

4. General Chemistry

   Topic(s): Petroleum

   Page(s) 554-555

5. Petroleum in our Age of Science

   Read entire pamphlet

   Pages 3-11

6. The World Book Encyclopedia

   Topic(s):(1) Petroleum - pages 292-293
   (2) Petroleum Products - page 296
   (3) How petroleum was formed - page 297
   (4) Refining petroleum - page 305

   Handout(s):

   I. Worksheet to complete on general information about petroleum.

   Filmstrip(s):

   1. Oil: From Earth to you
   2. Petroleum in Today's Living

Activities

Check with your teacher before you start working on section 4.

Also; check with the teacher after completing learning goal 4 in Section IV.

Self Evaluation - Section IV

1. What is the difference between crude oil and petroleum?

_____

_____

2. How is the study of petroleum related to the element carbon?

_____

_____

3. Name four products we can obtain from crude oil:
   1. _____
   2. _____
   3. _____
   4. _____

4. What does the term fractional distillation mean? _____

_____

5. What accounts for the fact that different components of crude oil can be distilled off at different levels during the fractional distillation process? _____

_____

_____

6. Name and define the names of three instruments which can be used to detect oil deposits.

Name	Define
1. _____	_____
2. _____	_____
3. _____	_____

7. State the name and content of the theory which best explains how petroleum or crude oil originates:

Advanced Study - Section IV

1. Make a diagram illustrating what is found in a barrel of petroleum and the per-cent of each product named.

2. Make an illustration which displays the fractional distillation of oil and what product is obtained at each level of the distilling apparatus.

3. Make a model display of the process used for transporting system of petroleum from the oil well to the consumer.

4. Write a report consisting of information on "Interesting Facts About Petroleum."

5. Make a report which summarizes some uses for each product obtained from the fractional distillation of petroleum.

6. Make a detail write up on the procedures scientists use to find petroleum.